from the production of linalylacetate have been used for this purpose.

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Narcissus Absolute from Concrète.

Narcissus Absolute is prepared from **Narcissus Concrète** which is extracted by petroleum ether or benzene from the flowers of **Narcissus Poeticus,** also known as "*Pinkster Lily*" or "*Pheasant's Eye*" (the latter name, however, often refers to adonis, a different flower).

Presumably originating in the Middle East or the eastern Mediterranean countries, the narcissus now grows wild in the south of France and sporadically in other areas. It is cultivated in the Grasse region of France, in Holland, and in numerous other countries for its flowers, but only the two former countries produce extracts from **Narcissus Poeticus** flowers.

Narcissus Concrète is very rarely offered since the narcissus fragrance is used almost exclusively in high-class perfumes for lotions where alcohol solubility is a necessity. A few, larger users of **Narcissus Absolute** may purchase the concrète and undertake the final alcohol washings themselves.

Narcissus Absolute is a dark green or dark orange, occasionally dark olive-colored, viscous liquid, at times somewhat grainy due to a separation of waxes which have not been eliminated quantitatively during the alcohol washings. The odor of narcissus absolute is strongly foliage-green, very sweet-herbaceous over a faint, but quite persistent floral undertone. The tenacity is very good. There is a distinct difference between the two French types of narcissus absolute: "des plaines" which is orange-colored, very viscous, and has a floral-sweet, mild and rich, but not very powerful odor. This type is mainly derived from the Grasse area. The other type, "des montagnes", is a greenish-brown, viscous liquid of powerful, sharp, somewhat violet-leaf-like odor of green and somewhat earthy type. The undertone is sweet and balsamic-spicy, reminiscent of carnation and hyacinth, but still carrying a strong, green foliage note. This type is derived mainly from the Estérel area in the south of France. The terms "des plaines" and "des montagnes" actually refer to the cultivated and the wild growing plants. The Dutch production is derived exclusively from cultivated plants (corresponding to "des plaines"). The annual production of narcissus absolute is estimated at less than 100 kilos.

Accordingly, the use of this fine flower absolute is rather limited. It demands great skill and experience to exploit fully the effects of this material. Well blended with synthetic materials such as para-cresyl caprylate (= octoate), various high-boiling phenylacetates, tolyl acetate, hexyl cinnamic aldehyde, bucinal, heliotropyl acetone, methoxy phenyl butanone, phenyl dimethyl carbinol, isoeugenol, etc. or with natural materials such as clove bud absolute, carnation absolute, jasmin absolute, orange-flower absolute, ylang-ylang absolute, rose de mai absolute, mimosa absolute, etc., the best effects of **Narcissus Absolute** may show off to the fullest extent.

Although not always adulterated, narcissus absolute is often sold in a more or less "compounded" or "bouquetted" form, with additions of violet leaf absolute, mimosa absolute, methyl tuberate, indole, etc. which give an impression of power.

Néflier Concrète.

The small evergreen tree, **Eriobotrya Japonica** is originating in China and Japan, and better known for its refreshing fruit, the Japanese medlar, also known as the loquat. The tree, which belongs to the family of Rosaceae, was introduced in the Mediterranean countries more than a century ago. It is also cultivated as an ornamental plant and for its fruits in southern California, Texas and Florida, U.S.A. Furthermore, it is cultivated in Brazil for the fruits which are very popular there. Ships from the Far East brought back shoots of this shrub or small tree to Europe in the middle of the 19th century, and the trees were later introduced in the U.S.A. Only very recently, a few perfume houses became interested in the fragrant flowers and leaves of the "néflier" as it is called in the south of France. Experiments with perfume oil production were carried out in Spain and France.

A **Concrète** of **Néflier** (flowers and leaves) was prepared by cold extraction, but the yield was very small. The concrète is a dark-green or dark olive-green colored, soft paste of extremely rich, delicately floral odor, reminiscent of lilac or

hyacinth, however, more suave-balsamic than the odor of these flowers.

If it were made available in reasonable amounts, **Nèflier Concrète** would undoubtedly prove of wide interest in floral perfume bases such as appleblossom, sweet pea, freesia, lilac, muguet, etc. Since the concrète is soluble in 95% alcohol, it is generally not necessary to produce an **Absolute of Néflier.** The odor yield from the concrète is very encouraging, but a regular production of **Néflier Concrète** is not yet effective.

Neroli Oil.

Neroli Oil is the essential oil water distilled from the flowers of the cultivated bitter orange tree, **Citrus Aurantium,** subspecies amara, which also is important for the production of petitgrain oil ("bigarade"-type) and bitter orange peel oil (see these monographs). The flowers from the sweet orange tree are not used for the distillation of one particular essential oil, but occasional admixture, contamination, etc. of the bitter orange flowers with sweet orange flowers is possible.

Neroli oil, also called **Neroli Bigarade Oil** (néroli bigarade pétales) or **Orange Flower Oil** is produced in the south of France, Italy, Tunisia, Morocco, Haiti, Guinea, Comoro Islands, Algeria, Lebanon and, in small quantities, in China, Spain, Egypt, Cyprus, etc. France, Italy and Tunisia hold first places in quantity. France and Tunisia lead in quality. The Haitan oil is quite different. It is produced by *steam* distillation of a mixture of bitter orange flowers and the flowers from the "shaddock" grapefruit tree. The flowers suffer under poor transportation conditions prior to the distillation. The Haitian oil offers interesting notes as a modifier or as an individual perfume material, rather than as a replacement for the French or Tunisian oils.

Since **Neroli Oil** is sold at about half the price of jasmin absolute, and is produced in annual quantities of several tons (provided there have been no severe frosts), the oil has substantial economical importance for the countries in which it is produced. Added to the production of orange flower extracts (see **Orange Flower Absolute** and **Concrète**), the total production of orange flower perfume materials can be valued at somewhere between 3 and 5 million U.S. dollars annually.

The orange flowers must be distilled immediately after being picked in order to avoid decay and unpleasant off-notes due to decay processes. After having processed the flowers, the distillers usually carry on with distillation of leaves (petitgrain bigarade oil) since the trees are trimmed anyway. Thus, production of petitgrain bigarade oil follows shortly after that of neroli oil from the same plantation. It is of interest to note at this point that a good, terpeneless petitgrain bigarade oil is one of the most suitable adulterants for neroli oil.

Neroli Bigarade Oil is a pale yellow, mobile oil which becomes darker and more viscous on ageing. The odor is very powerful, light and refreshing, floral with a peculiar sweet-terpeney topnote, but its tenacity is rather poor. This oil is primarily a "top-note" material in perfumery. The keeping qualities of neroli oil are very poor, and its odor loses its freshness after a few months if the oil is not kept cool, dark and well sealed.

Neroli Oil is one of the "classic" materials in eaux de cologne of the "Maria Farina" type, "4711", etc. It blends excellently with all the citrus oils, with numerous floral absolutes and countless synthetic materials. Next to rose, jasmin and ylang-ylang, it is probably one of the most frequently used "florals" in perfume compounding. Most perfumers have a number of "neroli bases" on their shelf to be used when a cost problem or availability problem prevents the perfumer from using the natural neroli oil. Artificial neroli oils may be composed of terpeneless petitgrain oil, bitter orange oil, indole, linalylacetate, linalool, methyl-beta-naphthyl ketone, decanal, nonanal, decanol, nonanol, nerol, nerolidol, isojasmone, hydroxycitronellal-methyl-anthranilate (Schiff's base), phenylethyl alcohol, menthanyl ketone, nopyl acetate, lime oil expressed or terpeneless, tolu balsam, beta naphthyl ethyl ether, skatole, terpeneless lavandin oil, decyl propionate, propenyl-N-methylanthranilate, geraniol, various aliphatic aldehydes, aldehydic bases, specialties, etc.

When **Neroli Oil** is dissolved in alcohol, the solution shows a beautiful blue fluorescence which fades away on ageing of the solution in daylight. Old neroli oils do not always show this fluorescence in solution. Incidentally, this phenomenon is not at all appreciated by the perfumers in general, and great efforts are made to avoid this visible sign of the presence of anthranilates. It is conceivable that the anthranilates in the neroli oil

slowly add their molecules to the aldehydes in the oil, thereby producing a more intense yellow (darker) color, while the fluorescence disappears.

Neroli oil is not quite insoluble in water, and, during the distillation of the flowers, significant amounts of oil remain dissolved in the condensed distillation water. This solution is known as **"Orange Flower Water"**, and was once a very popular cosmetic ingredient, household flavor for baked goods, etc. This water does not keep well; it loses its fresh floral aroma and bouquet, and it is subject to fungus growth. Today, there is insufficient demand for this water, and the producers instead extract the water with a hydrocarbon solvent. This leads to the so-called **"Orange Flower Water Absolute"** (see monograph). Every three tons of distillation water yield about one kilo of orange flower water absolute; this is another interesting perfume material, entirely different from neroli oil in composition and odor type. Other "water absolutes" are produced from distillation of leaves and twigs of the bitter orange tree (see monograph: **Orange Flower** and **Petitgrain Water Absolute**).

Neroli Oil has only limited use in flavors, but it can produce interesting effects as a modifier in fruit flavors for candy (e.g. with bergamot oil), in flavors for liqueurs, soft drinks, etc. The average use level is strongly dependent upon the type of other flavor materials present. In general, the most useful concentration of neroli oil in flavors should be slightly in excess of the **Minimum Perceptible** which is about 0.03 to 0.06 mg%. Maximum use level is estimated at 0.50 mg%.

The production of **Neroli Oil** is heavily influenced by the weather conditions, and there are years of very small crops where the oil is scarce or unavailable. The quality of the oil varies from one area of production to another. These circumstances, together with the comparatively high price level of neroli oil, have to a certain degree encouraged adulteration of the oil.

Niaouli Oil.

Among the more well-known "tea-tree" oils (see monographs on **Melaleuca Oils**), is **Niaouli Oil** which is steam distilled in New Caledonia (French Pacific islands) from the leaves of **Melaleuca Viridiflora.** The tree grows wild and in such abundance that cultivation is not at all necessary. Production of the oil has been as high as 60 metric tons in one year, but the interest in the genuine oil has declined significantly. Production in 1959 was about 10 metric tons.

The New Caledonian tree is a native of Australia and it exists in several physiological forms. The **Melaleuca Viridiflora** which yields **Niaouli Oil** is usually considered as a "typical" form of the tree, while the varieties which still grow in Australia yield oils of entirely different composition. The best known of these Australian oils is the **Melaleuca Viridiflora,** variety "A" (see monograph). The essential oil from this tree contains significant amounts of **Nerolidol,** and the oil has at one time been considered as a possible source for isolation of this interesting sesquiterpene alcohol.

Niaouli Oil, also called **Gomenol** in French speaking countries is a pale yellow to greenish-yellow or almost colorless liquid of strong, fresh, sweet-camphoraceous, but cooling odor, reminiscent of eucalyptus oil and cardamom oil, however, less spicy than the latter. The flavor is warm, only slightly biting, aromatic, somewhat sweet and fresh eucalyptuslike. The sweetness in odor and flavor is quite characteristic, different from eucalyptus oil, cajuput oil, etc.

Niaouli Oil is used in medicinal or pharmaceutical preparations, in flavors for cough drops, more or less as an active ingredient in vaporizer liquids, mouth sprays, gargles, toothpaste flavors, etc. The oil is frequently adulterated in countries where it is not readily available (far from the source of supply). Eucalyptus oil, to which is added trace amounts of terpinyl esters, aldehydes, terpineol, terpinolene, benzaldehyde, borneol, etc. is often sold as niaouli oil. The fact that the larger part by far of the entire production of niaouli oil is shipped indirectly from New Caledonia to the consumers, is a major cause of the frequent adulteration. Large amounts of **Niaouli Oil** are used locally for all kinds of ailments.

Nigella Damascena.

Originating in the Middle East and growing wild in that area, in Turkey and in southern Europe, is the small plant **Nigella Damascena.** On account of its beauty it is also cultivated in many European countries as far north as Scandinavia. It is known as a garden plant under the name of **"Virgin in the Green"** (in Eerope) or the no less romantic **"Love-in-a-Mist"** (in the United States). Erron-